Case Report **Open Access**

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A case of factitious hyponatremia and hypokalemia due to the presence of fibrin gel in serum

Abstract: We describe here the case of a 84-year-old woman under warfarin therapy for atrial fibrillation, who was admitted to the Emergency Department for severe gluteal hemorrhage. Blood samples were drawn after patient admission and transported within 20 min to the laboratory. Results of laboratory testing revealed a markedly increased value of international normalized ratio and extremely low values of serum sodium (60 mmol/L) and potassium (1.4 mmol/L). A second serum sample was collected approximately 2 h after the former, showing normal values of both sodium (145 mmol/L) and potassium (3.5 mmol/L). The analysis of the specimen collected upon patient admission revealed the presence of a small, transparent fibrin gel in the serum, which was partially aspirated by the sample probe of the instrument. This case underscores the importance that serum samples need to be allowed to clot completely prior to centrifugation and analysis, especially those collected from patients under anticoagulant treatment.

Keywords: emergency department; error; hyponatremia; hypokalemia.

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Introduction

Hyponatremia is traditionally diagnosed in the presence of a serum sodium concentration lower than 136 mmol/L, whereas severe hyponatremia is diagnosed in the presence of a sodium level lower than 120 mmol/L [1]. Hypokalemia is instead diagnosed in the presence of a serum potassium concentration lower than <3.5 mmol/L [2]. Both hyponatremia and hypokalemia, medical emergencies requiring immediate therapeutic intervention, are frequently observed in patients admitted to the emergency department (ED). More specifically, the prevalence of moderate and severe hyponatremia in ED can be as high as 18% and 0.3%, respectively [3], whereas that of hypokalemia can be as high as 11% [4]. The timely identification of these conditions is as vital as the identification of the underlying cause. We describe here the case of factitious hyponatremia and hypokalemia caused by the presence of fibrin gel in serum.

Case presentation

A 84-year-old woman in therapy with warfarin for atrial fibrillation was admitted to the Emergency Department (ED) of the Academic Hospital of Parma (Italy) for a severe gluteal hemorrhage. Blood samples were drawn after patient admission and transported within 20 min from collection to the laboratory, which is located five floors above the ED. In our facility, clinical chemistry testing is performed on a Beckman Coulter AU5800 (Beckman Coulter, Brea, CA, USA) using serum collected into 13×100 mm, 5.0 mL BD Vacutainer® SST II Plus tubes containing clot activator and gel (Becton Dickinson, NJ, USA), after separation by centrifugation according to manufacturer's instruction (i.e., 1500×*g* for 10 min). The results of laboratory testing requested upon ED admission revealed a dramatically elevated prothrombin time-international normalized ratio (PT-INR, 29.8), a concomitantly increased value of activated partial thromboplastin time (APTT, 2.3

ratio), anemia (hemoglobin, 75 g/L), decreased glomerular filtration rate (GFR, 22 mL/min/1.73m^2), along with extremely low values of serum sodium (60 mmol/L) and serum potassium (1.4 mmol/L), which were clearly incompatible with the clinical condition.

After consultation with the laboratory personnel, a second blood sample was collected in the ED approximately 2 h after the former. In the meantime, the patient had received an intravenous injection of 10 mg vitamin K (Konakion, Roche S.p.A., Milan, Italy) to restore a safe degree of coagulation. The test results on the second blood sample were almost unchanged, with the exception of a substantial reduction of both INR (3.5 ratio) and APTT (1.7 ratio), along with normal values of both serum sodium (145 mmol/L) and potassium (3.5 mmol/L). An accurate analysis of the serum specimen collected upon patient admission in the ED revealed the presence of a small, transparent fibrin gel in serum, which could only be detected after serum was pipetted into another tube.

Discussion

This case of extreme hyponatremia and hypokalemia observed in an ED patient draws attention to the impact of inappropriate coagulation of serum samples despite the presence of a clot activator in primary blood tubes. The main reason for these abnormal findings can be attributed to a combination of the relatively short time that passed between sample collection and centrifugation (approximately 30 min, which is virtually identical to that recommended by the manufacturer) and the patient's overcoagulation likely being attributable to warfarin overdosage, impaired renal function, or both. The first serum sample was quickly sent to the laboratory, and the high degree of anticoagulation had probably prevented optimal clotting of the specimen, which instead continued to coagulate after centrifugation. This led to the presence of a cell-free and thereby virtually invisible fibrin gel in serum, which was partially aspirated by the sample probe of the ion selective electrode (ISE) module. In the Beckman Coulter AU5800, the ISE module is physically separated from the clinical chemistry modules. It is also noteworthy that the results of sodium and potassium were not flagged for anomalous sampling, and this may be due to the fact that a partial amount of serum (approximately 40%) was still aspirated by the ISE sample probe together with the fibrin gel. Besides low sample coagulability due to the presence of excess warfarin or heparin anticoagulation, additional cases have been previously reported in the scientific literature, in which incomplete or abnormal sample aspiration by the sample probe of laboratory instrumentation occurred as a consequence of high plasma density [5] or presence of contrast dyes [6].

This case underscores the importance that, despite the presence of clot activators, serum samples need to be allowed to clot completely prior to centrifugation and analysis. Moreover, although it is conventionally recommended that serum tubes should be allowed to clot for 30 min in patients without anticoagulants, we provide further evidence that this time may be insufficient in obviously overcoagulated patients or in the presence of exogenous heparin contamination.

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